

## CONTRIBUTIONS TO THE HERPETOLOGY OF PORTO RICO

BY KARL PATTERSON SCHMIDT

As a part of the Scientific Survey of Porto Rico inaugurated by the New York Academy of Sciences and carried on with the coöperation of The American Museum of Natural History and other institutions, it was my good fortune to conduct the first herpetological field-work in the summer of 1919. For this purpose Mrs. Schmidt and I spent the period from August 3 to October 8 on Porto Rico and the adjacent islands, which are under the same political jurisdiction.

For cordial assistance in furthering our work, I am especially grateful to Mr. and Mrs. B. A. Wall, of San Juan; Mr. E. M. Bruner, Forester of Porto Rico; Mr. Marc Lejeune, of Mayaguez, who made possible the trip to Mona Island, and to Colonel George A. Shanton, Chief of the Insular Police.

The exceptionally thorough and exhaustive "Herpetology of Porto Rico" by Dr. Leonhard Stejneger is available as a handbook of the reptiles and amphibians, making it possible to identify the species in the field and thus facilitating the study of habits and habitat associations. Dr. Stejneger has given an excellent résumé of herpetological work on Porto Rico previous to his own. The herpetological papers which have appeared since 1902 relating to the fauna under consideration are given in the bibliography at the close of this paper.

Collections were made on the islands of Porto Rico, Mona, Vieques and Culebra. Notes on the relation between the distribution of the species and the types of habitat will be found below under the discussion of individual species. The addition of six species of *Eleutherodactylus* to the Porto Rican fauna, five of which are here described as new, is an unexpected result of the expedition. All but one of these were captured with the aid of an electric hand-lamp while they were singing at night. This method of stalking is well known to those who have studied the notes of amphibians. The voices of *Eleutherodactylus*, as of other frogs and toads, are useful characters for distinguishing the species.

The expedition secured over twelve hundred specimens, comprising thirty-one species. To this collection are added more than a hundred specimens obtained by previous expeditions of the survey (H. E. Anthony, T. H. Jones, F. E. Lutz, R. W. Miner, J. T. Nichols), making the total

number of specimens, on which this report is based, much larger than any previously made in Porto Rico and equaling in completeness that of the National Museum.

The present paper is preliminary to the general account of the herpetology of Porto Rico to be published by the New York Academy of Sciences in the volumes embodying the results of the Scientific Survey of Porto Rico and the Virgin Islands.

## AMPHIBIA

### **Bufo Laurenti**

#### **Bufo lemur (Cope)**

This species, five specimens of which were collected at Coamo Springs, has previously been known from the north side of Porto Rico; the only exact locality being given as Arecibo by Stejneger. Its occurrence at Coamo Springs, nearly at the opposite side of the island, proves that it is widely distributed.

The five half-grown specimens are so nearly uniform and were found in so circumscribed an area that they probably are members of a single brood. They agree in coloration with the juvenile specimen described by Stejneger (1904, p. 572) and all show the hour-glass shaped dark mark on the shoulders. The dimensions of one of these specimens may be compared with those of an adult recorded by Stejneger:

	A. M. N. H. No. 10151	U. S. N. M. No. 27148
Tip of snout to vent.....	37 mm.	83 mm.
Tip of snout to posterior edge of tympanum.....	12 "	29 "
Greatest width of head.....	13 "	32 "
Foreleg from axilla.....	21 "	51 "
Hind leg from vent.....	37 "	99 "

The stomach contents of these specimens included ant remains, beetle wings, an insect larva, and segments of a small millipede.

### **Leptodactylus Fitzinger**

#### **Leptodactylus albilabris (Günther)**

The following localities are represented by sixty-three specimens in the collections: Adjuntas, Aibonito, Bayamon, Caguas, Coamo Springs, Maricao, San Turce, Utuado, El Yunque, and Culebra Island.

This species exhibits a great variability in coloration, with a relative uniformity in structural characters. Fowler (1918, p. 3, Fig. 1) has

figured the extremes of color pattern in Porto Rican specimens. Of fifty specimens in the present series, seven have the broad median stripe on the back, the others varying chiefly in the distinctness of the dorsal V-shaped markings. The measurements of the largest specimen and of one apparently recently transformed are as follows:

	A. M. N. H.	
	No. 10182	No. 10036
Tip of snout to vent.....	49 mm. <sup>1</sup>	16 mm.
Tip of snout to posterior edge of tympanum.....	18 "	7.5 "
Greatest width of head.....	17 "	7 "
Foreleg from axilla.....	29 "	10 "
Hind leg from vent to tip of longest toe.....	78 "	24 "

Eight of twenty-five stomachs examined were empty. Four contained land snails; two contained spiders (one a large lycosid spider and egg sack); two contained ants; two contained beetles; two contained bugs; two contained flies (*Muscidae*); one a small moth; one a large caterpillar; one a medium-sized cockroach; and seven the remains of an unidentifiable insect.

The nest of this species was observed by Stejneger (1904, p. 579) under a flat stone in a stream. Peters (1877, *Monatsber. Akad. Wiss. Berlin*, 1876, p. 709) records one observed by Gundlach in a "wet burrow." At Coamo Springs, on the terrace behind the bath-houses of the hotel, the water of some of the springs forms a permanent rivulet at the base of the cliff. *Leptodactylus albilabris* was abundant on the terrace, beneath loose stones. Under a large stone at the edge of the creek, on August 27, 1919, I found a shallow, rounded excavation, 6 or 7 cm. in diameter and about 3 cm. deep, filled with a mass of white foam, in which were the small tadpoles of this species (12 mm. in length, body 3-4 mm.). There were between seventy-five and one hundred tadpoles in the foam-mass, and not confined to the central hollow, as described by Stejneger. The bottom of the excavation was about 3 cm. above the water level. Two similar excavations, though empty, were discovered in the immediate vicinity, in the same relative position with reference to the water. On August 29, near Bayamon, a small mass of foam, between 3 and 4 cm. in diameter, containing similar tadpoles, was found under a stone on a hilltop, with no water whatever in the neighborhood. On October 1, near the Forester's cabin, on El Yunque, at about 1200 feet, a nest of this species was observed under a rotten log, beside a pool of standing water (also at a slightly higher level than that of the water). This nest contained between 150 and 200 eggs uniformly distributed

<sup>1</sup> 144 mm., given by Stejneger (1904, pp. 576, 578), is obviously a misprint.

through the foam and with no central hollow. It was somewhat larger than those previously observed, measuring 8 cm. in diameter. The eggs are light yellow, and measure 2.5 mm. to 3 mm. in diameter. The smallest tadpoles taken, swimming at large, measure 6 mm. in body length, which probably represents their maximum size at the time they escape from the foam. It is evident that the tadpoles usually will be washed from the nest into the adjacent water by a flood or heavy rain. The small nest isolated from water was probably a mistake on the part of the frog, and the nest described by Stejneger under water probably had been covered by a rise in the creek after the deposition of the eggs. The largest larvæ, nearly ready to transform, measure 13 mm. from snout to vent. The V-shaped dorsal markings are already evident in the tadpoles at this stage. The median dorsal white line is probably an adult character.

### **Eleutherodactylus Duméril and Bibron**

#### **Eleutherodactylus auriculatus (Cope)**

The following localities are represented by two hundred and seven specimens in the collection: Adjuntas, Aibonito, Alto Manzano, Cataño, Coamo Springs, Jayuya, Maricao, Rio Piedras, San Turce, Vega Baja, and El Yunque. *Eleutherodactylus auriculatus* occurs in Santo Domingo and Cuba as well as in Porto Rico, the type locality being Cuba. It appears to be rare in Cuba and Santo Domingo, while in Porto Rico it is exceeded in abundance only by the ubiquitous *Leptodactylus albilabris*. Its closest relative appears to be the *E. martinicensis* of the Lesser Antilles.

*E. auriculatus* is remarkable for its color variation, with a comparatively stable structure, but a considerable variation in measurements. A specimen in the collection of Prof. G. E. Johnson, of the University of Porto Rico, collected by him in the Luquillo Forest, is remarkable for its size, but it apparently is a giant individual of *E. auriculatus*. The maximum size in over three hundred specimens in the National Museum and the present collection is 44 mm. from snout to vent, while Professor Johnson's specimen measures 52 mm. Its measurements compared with the largest in the present series are as follows:

	A. M. N. H.	
	No. 10241	Johnson coll.
Tip of snout to vent.....	44 mm.	52 mm.
Tip of snout to posterior edge of tympanum.....	18 "	20 "
Greatest breadth of head.....	19 "	23 "
Foreleg from axilla.....	29 "	35 "
Hind leg from vent.....	69 "	80 "



The most frequent coloration is a grayish brown of varying shade, sometimes reddish, sometimes nearly black, which may be uniform or mottled. In the lighter specimens there is nearly always a dark inter-orbital mark, and in a few the snout is white in front of this, either with a broad transverse white band or completely light to the tip of the snout. There is usually also a dark subcanthal mark, interrupted by the eye, and continued over the ear for a short distance. In a few cases the dorsum is spotted irregularly with vivid white spots. Of one hundred and ninety-four examined, eighteen have a light line beginning at the

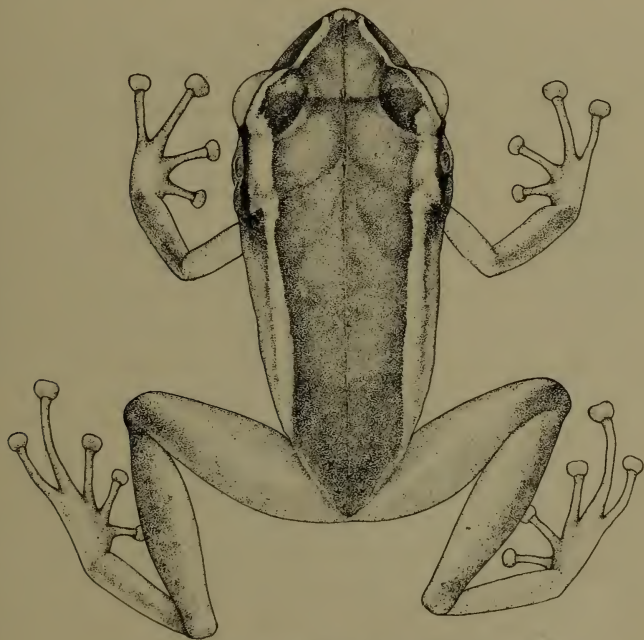


FIG. 1.—*Eleutherodactylus auriculatus* (Cope), ♂

A. M. N. II. No. 10249. A common phase of coloration. Twice natural size.

snout and passing over the edge of the eyelid to the ear, continuing as a broader light dorsolateral band to the thigh. In nineteen specimens there is a sharp median white stripe (compare Fowler, 1918, Fig. 2). Five have a broad median light band, about four times as broad as the more common narrow line. The hind legs are occasionally distinctly barred, more usually indistinctly barred or uniform. The concealed surfaces of the thighs are often bright pink or red. The venter is usually light and unspotted, occasionally spotted with groups of dark-brown punctuations. In no specimen were the concealed surfaces of the thighs reticulated with the fine or coarse dark network of *E. antillensis*.

Persistent search about the banana plants, under the leaves of which adults hide during the day, failed to discover the eggs of this species, and it was not until the writer visited the Luquillo Forest that a single egg-mass was discovered in a basal leaf of an air plant, just at the surface of the water in the lower part of the leaf. A large *E. auriculatus* in the same plant, but not on the same leaf as the eggs, escaped. There are thirty-six eggs, with well-advanced embryos, adhering in an oval mass from which individual eggs are easily detached. The eggs measure 6-8 mm. in greatest diameter, being somewhat elongated in the axis of the embryo.

The young of this species are extraordinarily abundant, and it is difficult to understand why the eggs are so infrequently observed. It is possible that at the time of my visit (August to October) the height of



FIG. 2.—Embryo of *Eleutherodactylus auriculatus*

A. M. N. H. No. 10302. Four times natural size.

the breeding season had passed. The only previously recorded date of breeding is that observed by Gundlach, May 24 (Peters, 1877, Monatsber. Akad. Wiss. Berlin, 1876, p. 709). Professor Johnson found a mass of eggs on July 8, with embryos at about the same stage as the writer's, in the same bunch of moss in which the giant female specimen, mentioned above, was collected. Gundlach (loc. cit.) also observed a female sitting on the egg-mass received by him, while Bello y Espinosa (Martens, 1871, Zoöl. Garten, XII, p. 351) records that in the case observed by him the parent frog remained in the neighborhood of the eggs "as if to guard them." From these several observations it appears not unlikely that the female does remain in the neighborhood of the eggs until they are hatched, but further observations on this point are desirable. Ruthven (1915, Occas. Papers, Mus. Zoöl. Univ. Michigan, No. 11), observing the breeding habits of *E. cruentus* (Peters) in Colombia, found no evidence of such a habit.

### ***Eleutherodactylus gryllus*, new species**

Sixteen specimens from Maricao and El Yunque were collected.

#### *Diagnostic Characters*

Distinguished from *Eleutherodactylus auriculatus* by a shorter snout, less granulate venter, and its minute size.

*Range*

Taken at El Yunque and Maricao, probably confined to the coffee belt and the wet rain forests above it.

*Type*

A. M. N. H. No. 10307, ♂, El Yunque, near the Forester's cabin (about 1300 feet), September 30, 1919, Karl P. Schmidt.

*Description of Type*

Habitus of *Eleutherodactylus auriculatus*, but with a distinctly shorter snout, its length equal to the diameter of the eye (in *E. auriculatus* the diameter of the eye equals its distance from the nostril), and to the interorbital space; canthus rostralis rounded; nostril one-third the dis-



FIG. 3.—*Eleutherodactylus gryllus*, new species

A. M. N. H. No. 10226. Twice natural size.

tance from tip of snout to eye; tympanum scarcely distinct, one-fourth the diameter of the eye, its distance from the eye equal to its diameter; toes without vestige of web; digital disks well developed; first toe as long as the second; an inner and outer metatarsal fold; vomerine teeth in two oblique patches behind and within the choanæ; tongue large, slightly nicked behind; skin smooth above, but apparently much more glandular than in *E. auriculatus*; venter strongly granulate; a large subgular vocal sac.

Middle of the back, beginning with an interorbital line, dark gray, enclosing a light spot on the occiput; sides and snout lighter, the darker color everywhere consisting of minute black punctations, especially evident on the limbs and throat; venter light.

*Measurements*

Tip of snout to vent.....	16	mm.
Tip of snout to posterior border of tympanum.....	5.5	"
Greatest breadth of head.....	6	"
Foreleg from axilla.....	11	"
Hind leg from vent.....	24	"
Tibia.....	8.5	"

*Notes on Paratypes*

The type is a male, taken singing at night, with the usual pale night coloration. Specimens taken in the daytime (concealed under moss) are very dark in color and exhibit considerable variation in pattern, two having a light median dorsal line. In a specimen taken in an air plant (No. 10291) the dorsal dark area is cinnamon brown and the sides bright pale green, the legs with dark bars; this coloration has been described by Stejneger (1904, Rept. U. S. Nat. Mus., 1902, p. 586) as a variant coloration of juvenile *E. auriculatus*. The darker specimens have narrow light crossbands on the limbs. The granulation of the venter in the female specimens is faint, though still evident.

This species was found very numerous at Maricao and on El Yunque, singing frequently from trees, at least ten feet from the ground. On El Yunque specimens were collected in air plants, near the peak, and under moss on the rocks of the peak itself.

The note is a rapid succession of shrill clicks, very insect-like; the chorus sounding not unlike the rapid clicking of a telegraphic instrument.

Were it not for the minute size of the singers and the extremely distinct note, this species might well be considered the young of *E. auriculatus*. I am unable to agree with Stejneger's supposition that its note is made by juvenile males of the latter species. The gonads, at any rate, appear to be those of an adult in the specimens examined, differing in form and pigmentation from those of young *E. auriculatus* of similar size.

***Eleutherodactylus locustus*, new species**

A single specimen from El Yunque, just above the Forester's cabin, collected September 30, 1919.

*Diagnostic Characters*

Size small, snout obtuse, nostril much nearer to the end of the snout than to the eye; tympanum small, indistinct, one-fourth the diameter of the eye, separated from the eye by a little more than its diameter;



vomerine teeth in two oblique series, behind and within the choanæ; toes free; digital disks well developed; tibiotarsal articulation reaching the posterior border of the eye; heels overlapping when the legs are placed at right angles to the body; skin rugose above, with scattered round tubercles, especially on the eyelid; venter smooth; inner face of thighs finely rugose.

### Range

Known only from the type locality.



FIG. 4.—*Eleutherodactylus locustus*, new species

A. M. N. H. No. 10240, type. Twice natural size.

### Type

A. M. N. H. No. 10240, ♂, El Yunque, near the Forester's cabin (about 1300 feet), Luquillo Forest Reserve, Porto Rico, September 30, 1919, Karl P. Schmidt.

### Description of Type

Head slightly longer than broad, slightly narrower than the body; snout moderately obtuse, its length anterior to the eye exceeding the interorbital space; nostrils one-fourth the distance between eye and tip of snout from the latter; tympanum scarcely distinct, one-fourth the diameter of the eye, separated from the eye by a little more than its diameter; canthus rostralis rounded; elbow and knee pressed along the side, overlap; heels overlap when the legs are placed vertically to the axis of the body; tibiotarsal articulation reaching the posterior border of the eye; disks of fingers and toes well developed; toes without vestige of

web; inner and outer metatarsal tubercles present; no tarsal fold; first toe as long as the second; vomerine teeth in two linear oblique patches, converging posteriorly, well separated on the median line, behind and within the choanae by about the diameter of the choana; tongue large, slightly nicked behind; skin rugose above, with rounded tubercles; a well-marked mid-dorsal ridge from snout to vent; eyelid strongly rugose; venter smooth (faintly rugose under the lens); thighs slightly rugose; male with a large subgular vocal sac.

Dorsum gray, mottled with grayish brown; a well-defined interorbital dark band; sides of canthus with a dark mark, interrupted by the eye, extending over the tympanum, legs not barred, with dusky markings; venter uniform, light.

#### Measurements

Tip of snout to vent.....	19	mm.
Tip of snout to posterior border of tympanum.....	7	"
Greatest breadth of head.....	6.5	"
Foreleg from axilla.....	12	"
Hind leg from vent.....	29	"
Tibia.....	9	"

This species was discovered by accident, singing on a leaf some three feet from the ground. Its note is the most distinctive of any observed in Porto Rico, beginning with a shrill continuous note almost at the limit of audibility, which is followed by a succession of clicks. So closely does this note resemble a familiar type of note produced by long-horned grasshoppers that the writer neglected to search for the author of the sound, and watched the present specimen repeat the song several times before being convinced that it really proceeded from an *Eleutherodactylus*.

It is closely related to *E. auriculatus*, from which it is well distinguished by its small size and smooth venter. Even more closely related to the still smaller new species, *E. gryllus*, it is still readily distinguished by its smooth venter and more rugose dorsum, as well as by its song.

#### *Eleutherodactylus cramptoni*,<sup>2</sup> new species

Three specimens from the peak of El Yunque, September 30, 1919.

#### Diagnostic Characters

Size small, habitus stout; hind legs short; snout very obtuse, canthus rostralis rounded; dorsum very rugose with rounded tubercles; vomerine

<sup>2</sup> Named for Prof. Henry E. Crampton, whose active interest and investigation have greatly furthered the zoölogical work of the Survey.

teeth in two oblique linear series, extending laterally as far as the inner border of the choanæ; digital disks large; uniform dark brown above, light brown beneath.

### *Range*

Known only from the type locality.

### *Type*

A. M. N. H. No. 10305, ♂, peak of El Yunque, September 30, 1919, Karl P. Schmidt.

### *Description of Type*

Habitus stout, compact; snout short, obtuse, canthus rostralis rounded; nostril one-third the distance from tip of snout to eye; heel reaching the anterior border of the orbit; heels meet but do not overlap when the legs



FIG. 5.—*Eleutherodactylus cramptoni*, new species

A. M. N. H. No. 10305, type. Twice natural size.

are placed at right angles to the body; both anterior and posterior limbs notably stout, nearly twice as thick as those of *E. auriculatus* of the same body length; vomerine teeth in two linear, oblique series, extending laterally as far as the choanæ; tympanum small, distinct; dorsum covered with rounded tubercles, extending onto the eyelids and snout; venter finely granular; digital disks large; first toe as long as the second; no subgular vocal sac.

Color uniform brown above; lighter brown below and slightly variegated with lighter punctations.

*Measurements*

Tip of snout to vent.....	19	mm.
Tip of snout to posterior border to tympanum.....	6.5	"
Greatest breadth of head.....	7	"
Foreleg from axilla.....	12	"
Hind leg from vent.....	29	"
Tibia.....	9	"

*Notes on Paratypes*

The two paratypes are similar in every respect to the type, with the single exception that one of them is slightly more mottled with light and has the hind legs indistinctly barred.

The three small tree frogs described above were taken under moss in the crevices of the rocks on the peak of El Yunque. The species is a well-differentiated one, characterized by the stoutness of its limbs, the obtuseness of the snout, and the extreme rugosity of the dorsum.

***Eleutherodactylus antillensis*** (Reinhardt and Luetken)

The following localities are represented by thirty specimens in the collection: Aibonito, Bayamon, Maricao, San Turce, and Culebra Island. This species has previously been known only from St. Thomas (type

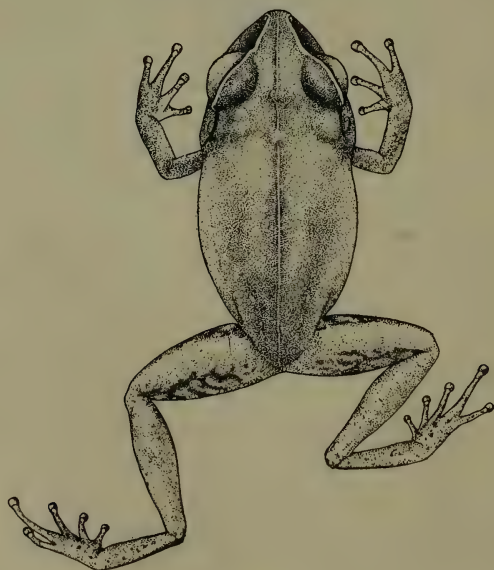


FIG. 6.—*Eleutherodactylus antillensis* (Reinhardt and Lütken), ♂

A. M. N. II, No. 10019. Twice natural size.



locality), Tortola, and Vieques. The present records add Culebra and Porto Rico to its range. Since it was discovered at widely distant points in Porto Rico, it probably is indigenous to that island. In San Turce, along the railroad and trolley embankments north of the Hotel Eureka, it is more abundant than *Eleutherodactylus auriculatus*.

The single specimen from Culebra agrees closely with the Porto Rican series. In coloration this species is less variable than *E. auriculatus*, but the median white dorsal line may be present or absent. It is developed in twelve of the present specimens. The usual color is grayish brown, with faint dusky markings, and a sharply defined black canthal line which extends over the ear and a short distance beyond it, outlined above in most cases by a very narrow white line on the canthus extending over the eyelid. The concealed surfaces of the legs are reticulated with black, which affords a fairly good character for distinguishing this species in the field from *E. auriculatus*. One specimen, No. 10001, ♂, was violet-red above, with a very heavy black canthal and supra-auricular mark, and with the concealed surfaces of the legs black with sharply defined white spots. When compared directly with *E. auriculatus*, this species is seen to be distinguished by the much heavier granulation of the venter and the much smaller digital disks, in addition to the difference in proportions noted by Stejneger. The measurements of the largest specimens of each sex follow:

	No. 10117 ♂	No. 10082 ♀
Tip of snout to vent.....	24 mm.	33 mm.
Tip of snout to posterior border of tympanum.....	10 "	13 "
Greatest breadth of head.....	11 "	14 "
Foreleg from axilla.....	16 "	19 "
Hind leg from vent.....	38 "	48 "

### ***Eleutherodactylus brittoni*,<sup>3</sup> new species**

Four specimens of this species were collected at Maricao and El Yunque, near the Forester's cabin.

#### *Diagnostic Characters*

Derived from *Eleutherodactylus antillensis*, from which it is distinguished by its small size, its sharp canthus rostralis, which is continued as a dorsolateral angle some distance behind the ear, and its more posteriorly placed nostril.

<sup>3</sup> Named for Dr. Nathaniel L. Britton, chairman of the Committee on the Scientific Survey of Porto Rico of the New York Academy of Sciences.

*Range*

Known from Maricao and El Yunque, it is probably confined to the coffee belt and the moist forests above it.

*Type*

A. M. N. H. No. 10318, ♂, El Yunque, near the Forester's cabin (about 1300 feet), September 30, 1919, Karl P. Schmidt.

*Description of Type*

Habitus slender, head narrower than the body, legs rather short, snout sharp, pointed; nostril two-fifths the distance from the end of the snout to the orbit; canthus rostralis sharp; interorbital space broader than the



FIG. 7.—*Eleutherodactylus brittoni*, new species

A. M. N. H. No. 10318, type. Twice natural size.

eyelid; heel reaching the anterior border of the orbit; heels meeting but not overlapping when the legs are at right angles to the body; top of snout flat, as is the anterior half of the back behind the eyes, the side of the body being vertical anteriorly; vomerine teeth in two small rounded patches, behind and within the choanæ; tympanum indistinct, separated from the eye by less than its diameter; dorsum smooth, venter coarsely granulate; digital disks small, as long as wide; a well-defined tarsal fold; a well-developed subgular vocal sac. Dorsum light grayish brown, venter lighter. Two black spots between the eyes, one on the middle of the back, and three posteriorly on the back, above the groin; legs with a single faint darker bar on the femur; concealed surfaces of the femur not reticulated; a black subcanthal streak, continued below the dorso-lateral angle behind the eye.

*Measurements*

Tip of snout to vent.....	16 mm.
Tip of snout to posterior border of tympanum.....	6 "
Greatest breadth of head.....	6 "
Foreleg from axilla.....	9 "
Hind leg from vent.....	23 "
Tibia.....	8 "

*Notes on Paratypes*

The three paratypes are closely similar in size and structural characters to the type. Two have the black subcanthal and shoulder mark outlined with white above. One lacks the dorsal black spots.

The specimen from Maricao was taken singing in herbage along the roadside, together with *E. auriculatus* and *E. antillensis*. Two were taken singing on El Yunque, likewise in low herbage, and the last was found by accident in collecting *E. wightmanæ*.

The note of this species is a succession of clicks, less shrill and less rapid than in *E. gryllus*.

This species stands in the same relation to *E. antillensis* as *E. gryllus* does to *E. auriculatus*.

***Eleutherodactylus wightmanæ*,<sup>4</sup> new species**

Thirteen specimens of this species were collected at Maricao and El Yunque, near the Forester's cabin.

*Diagnostic Characters*

Size small, snout pointed; nostril much nearer to the tip of the snout than to the eye; tympanum small, distinct, separated from the eye by about its own diameter; vomerine teeth in two straight series, in the same line, extending as far laterally as the choanæ, and about the diameter of a choana behind them; toes free, digital disks well developed; tibiotarsal articulation reaching the anterior border of the eye; heels overlapping when the legs are placed at right angles to the body; skin rugose above, with elongate folds and ridges; venter rugose; thighs granular.

*Range*

Luquillo Forest to Maricao, probably confined to the coffee belt and the wet forests above it.

<sup>4</sup> Named for the author's wife, Margaret Wightman Schmidt, whose loyal assistance contributed largely to the success of the work in Porto Rico.

*Type*

A. M. N. H. No. 10317, ♂, El Yunque near the Forester's cabin (about 1300 feet), Luquillo Forest Reserve, Porto Rico, September 30, 1919, Karl P. Schmidt.

*Description of Type*

Head as long as broad, narrower than the body; snout pointed, its length anterior to the eyes once and a half the interorbital width; nostrils one-third the distance between eye and tip of snout from the latter; tympanum distinct, small, about one-third the diameter of the eye, separated from the eye by a little more than its own diameter; canthus rostralis sharp; elbow and knee pressed along sides overlap; heels overlap when the legs are placed at right angles to the body;



FIG. 8.—*Eleutherodactylus wightmanæ*, new species

A. M. N. H. No. 10220. Twice natural size.

tibiotarsal articulation reaching the anterior border of the eye; disks of fingers and toes well developed; digits slender, free; first toe distinctly shorter than the second; no tarsal folds; vomerine teeth in two straight series, separated in the median line, extending laterally as far as the outer border of the choanæ, and about the diameter of a choana behind them; tongue large, slightly nicked behind; skin rugose above, with longitudinal lines or folds, the most distinct of which originate behind the orbits and extend backward about two-thirds the length of the back; a less distinct mid-dorsal ridge from snout to vent; venter and outer face of thighs rugose; a subgular vocal sac.



Brown above, with a black subcanthal line extending over the ear half way along the sides; a black spot on each side of the back over the groin; venter uniformly light; a single dark cross-band on the radius; one on the femur, tibia, and tarsus (in line when the legs are folded), and a dark spot on the metatarsus; anterior and posterior faces of the thighs dusky.

#### Measurements

Tip of snout to vent.....	20	mm.
Tip of snout to posterior border of tympanum.....	7.5	"
Greatest breadth of head.....	7.5	"
Foreleg from axilla.....	11	"
Hind leg from vent.....	30	"
Tibia.....	10	"

#### Notes on Paratypes

In structural characters the twelve paratypes agree closely with the type. Two specimens are light gray, instead of brown, with only indications of the black spots; in most specimens the postocular dark streak is broken up into a series of spots; one specimen is light brownish gray on each side, the area between sharply darker; the bars on the legs are distinct in all specimens.

The plaintive, diminuendo note of this small species is one of the most characteristic sounds in the amphibian chorus of the Luquillo forest. Its song consists of a series of six or eight whistled notes, each slightly louder in pitch and a little fainter than the last. It sings habitually on the ground or in the lowermost leaves of plants. It is particularly difficult to locate its position from its song, partly because it is usually well concealed, partly on account of the peculiar ventriloquy of its voice.

#### *Eleutherodactylus richmondi* Stejneger

Eleven specimens of this species were collected at El Yunque, between the Forester's cabin and the peak. This species is probably distributed throughout the virgin forest of the Luquillo Reserve. It should be looked for in the high forest south of Jayuya. Its relations with *E. lentus* of St. Thomas and *E. weinlandi* of Hispaniola add to the evidence of former land connections of the Virgin Islands and Hispaniola with Porto Rico.

Like the larger series examined by Stejneger, the present specimens are extremely uniform in structural characters and in coloration. The only variation noted is the occasional lightening of the chestnut color of the dorsal area between the light dorsolateral lines. The proportions

are quite different in this species from the other Porto Rican species of the genus:

	No. 10233
Tip of snout to vent.....	32 mm.
Tip of snout to posterior border of tympanum.....	13 "
Greatest breadth of head.....	12 "
Foreleg from axilla.....	21 "
Hind leg from vent.....	51 "



FIG. 9.—*Eleutherodactylus richmondi* Stejneger

A. M. N. H. No. 10237. Twice natural size.

Two extremely small specimens, measuring 9 and 11 mm. respectively, probably are recently transformed. They are colored like the adults.

## REPTILIA

### *Sphærodactylus* Wagler

#### *Sphærodactylus macrolepis* Günther

*Sphærodactylus macrolepis monensis* Meerwarth, 1901, Mitt. Naturh. Mus. Hamburg, XVIII, p. 20.

*Sphærodactylus monensis* Stejneger, 1904, Rept. U. S. Nat. Mus., 1902, p. 607.  
Barbour, 1914, Mem. Mus. Comp. Zoöl., XLIV, p. 270.

*Sphaerodactylus grandisquamis* Stejneger, 1904, Rept. U. S. Nat. Mus., 1902, p. 602, figs. 46-52. Barbour, 1914, Mem. Mus. Comp. Zoöl., XLIV, p. 270.

The following localities are represented by forty-five specimens in the collection: Aibonito, Bayamon, Cataño, Coamo Springs, Ensenada, Mariacao, El Yunque, and Mona Island. This species is found on Mona Island, throughout Porto Rico, and on most of the Virgin Islands (Vieques, St. Thomas, St. Croix, Tortola, Virgin Gorda, Anegada). Stejneger, with specimens from only two localities in Porto Rico (Luquillo and Ponce), described the Porto Rican and Vieques specimens as distinct from the Virgin Island form, as well as from that of Mona Island. He surmised that it was confined to the lowlands, whereas the present series proves that it reaches an altitude of at least two thousand feet.

Barbour (1917, p. 98), after examining a considerable series of *Sphaerodactylus macrolepis* from the Virgin Islands, expresses a measure of doubt as to the distinctness of *S. grandisquamis*. Stejneger separates *S. grandisquamis* and *S. monensis* from *S. macrolepis* solely on the size of the scales, which he gives as 34-38 about the body in *S. grandisquamis*. 46-48 in *S. monensis*. In the series from Porto Rico under consideration the variation is as follows:

Scales about the body.....	32	36	40	44	48	52	56
Number of specimens.....	2	8	3	4	5	6	2

In five specimens from Mona Island the number of scales varies from 44-52. As *S. macrolepis* is intermediate between *S. grandisquamis* and *S. monensis*, it is evident that the variation in the present series includes all three supposed forms. There is probably a somewhat different range of variation on the several islands, but the extremes are certainly included in that of the Porto Rican series. Reproduced tails have a much widened series of median ventral scales.

An egg, probably of this species, was found under a log at Aibonito, August 21, 1919. It is white, discolored by stains, with a hard and smooth shell, 6 x 4.5 mm.

### *Anolis* Daudin

#### *Anolis cuvieri* Merrem

Eleven specimens of this species were collected at Aibonito. *Anolis cuvieri* has been taken at Aibonito, Catalina Plantation (El Yunque), Humacao, Luquillo, Mayaguez, and Utuado. It is probably not found in the arid southwestern corner of the island, but ranges quite generally over the remaining part of Porto Rico. It is recorded from Vieques and

Tortola of the Virgin Islands. Its absence from the other Virgin Islands is probably due to difference in the habitat conditions. It is nearly allied to *Anolis ricordii* of Hispaniola.

There is little variation in this series. In No. 13234 the tail crest is unusually high, fully as high as in *A. ricordii* of Hispaniola, but the scale characters which distinguish *cuvieri* from *ricordii* are perfectly constant.

Seven out of eight stomachs examined contained the remains of large beetles; one, a large phasmid; one, remains of heteropterous bugs; and one, a mass of skin of *Anolis cuvieri* (doubtless its own). The boys say that it eats berries and fruits, and in the coffee plantations it is said to eat coffee berries. It seems probable that vegetable matter forms only a small proportion of its food, as in *Anolis cristatellus*.

### **Anolis cristatellus** Duméril and Bibron

The following localities are represented by three hundred specimens in the collection: Adjuntas, Aibonito, Bayamon, Cataño, Coamo Springs, Ensenada, Maricao, Mayaguez, Salinas, San Truce, Desecheo Island, Mona, Vieques, and Culebra. This species ranges everywhere in Porto Rico. It occurs also on Mona and Desecheo Island, to the west, and extends through the entire Virgin group to the east. I do not regard the records of this species from Santo Domingo as valid. A nearly allied form is found in the Turk's Islands (*Anolis albipalpebralis* Barbour).

Stejneger regarded the *Anolis* of Mona Island as a species distinct from *A. cristatellus*, differing in having larger scales on the head; hence fewer loreals and fewer scales between the occipitals and the semicircles; in having a much higher tail crest, and a somewhat peculiar coloration. I cannot agree in this separation. Specimens from Ensenada and Coamo Springs agree exactly with those from Mona, while *A. cristatellus* from Culebra Island has an even higher caudal crest than those from Mona. The coloration of the Mona specimens taken on limestone is not ordinarily seen in Porto Rican *cristatellus*, but specimens taken on limestones at Ensenada, Salinas, and Coamo Springs are similarly colored. Ordinary *cristatellus* with low tail crests occur in the same area, and it is obviously impossible to separate them. The species does differ somewhat on the various islands, but the variation curves overlap too greatly to warrant even subspecific distinction. The number of scales between the occipital and the semicircles varies as follows in forty specimens respectively from Vieques and Mona Islands:



Number of scales between occipital and semicircles.....	1	2	3	4
Number of specimens, Mona Island.....	14	18	8	0
Number of specimens, Vieques.....	5	16	12	7

The vertical rows of loreals in the same series are as follows:

Loreals.....	5	6	7
Mona Island.....	27	11	2
Vieques.....	12	22	8

In the present series of Porto Rican specimens, adult males which wholly lack the tail "fin" are frequent, and such specimens are even more frequent in Vieques. Thus, of thirty-nine males collected in Vieques, none have a high continuous "fin" like those of Culebra or Mona, twenty-seven have a low serrated crest, about one-third as high as the diameter of the tail, and twelve lack the crest entirely, having merely a compressed tail with a denticulate row of dorsal scales. This is evidently the condition referred to by Reinhardt and Luekten (1863, Vidensk. Med. naturh. For. Kjøbenhavn, p. 249), whose comment was inexplicable to Stejneger (1904, p. 640) because he lacked a sufficient series from Vieques. In going from Vieques to Culebra, the difference between the tail crests of the males is very striking, and if they were not linked by Porto Rican specimens they would certainly be regarded as distinct forms. Thus, out of twenty Culebra males, only four have a crest as low as the highest found in the Vieques specimens, and in the remaining sixteen it varies from a height equal to the vertical diameter of the tail to twice the diameter. Evidently we have an excellent example of the beginning of the process of differentiation through isolation on islands of this plastic species. The specimens from Desecheo present no peculiarities.

*Anolis cristatellus* reaches an altitude of at least two thousand five hundred feet, being associated with *Anolis pulchellus* on the deforested hills near Maricao. It is evident that the differences in the distribution of this species and *A. gundlachi* are due not to altitude, but to habitat conditions, of which light seems to be one of the determining factors, *A. cristatellus* being the species of open fields and roadsides, *A. gundlachi* of the thickly planted coffee plantations and of the forests.

The examination of one hundred stomachs yields the following information as to food habits: Empty, 22; unidentified insect remains, 15; beetle remains, 20 (larva and adults; a species of *Diaprepes* very abundant); Orthoptera, 16 (cockroaches, grasshoppers, and a single cricket and mantis); ants, 10; caterpillars, 9; bugs, 5 (mostly heteroptera, one large cicada); flies, 3; spiders, 3; vegetable matter, 9 (mostly brightly colored seeds); vertebrates, 2 (*Anolis* sp.).

The eggs are two or three in number, about 10 x 6 mm., uniformly oval, the surface white and striate. They are frequently found under the edges of logs or stones, or in debris about the base of banana plants.

### **Anolis gundlachi** Peters

Forty-eight specimens of this species were collected at the following localities: Adjuntas, Aibonito, Maricao, and El Yunque. This species is very distinct from *A. cristatellus*, but is obviously directly related to that species. Its range and habitat are much more restricted and the amount of variation is accordingly smaller. In the present series the height of the tail crest (at its highest point) reaches a maximum of three times the diameter of the tail at the same point.

### **Anolis stratulus** Cope

The following localities are represented by fifty-eight specimens of this species in the collection: Aibonito, Coamo Springs, Ensenada, Maricao, El Yunque, and Vieques and Culebra Islands. The distribution of *Anolis stratulus* is closely similar to that of *Anolis cristatellus*, occurring on Porto Rico, Vieques, Culebra, St. Thomas, Tortola, and Jost Van Dyke. It is not found on Mona Island, and has not been recorded from St. Croix, where it might logically be expected to occur.

The series under examination shows only slight variation. The majority of specimens have the supraocular semicircles in contact. One (No. 13282) has only a single row of scales between the occipital and the semicircles. In recently hatched specimens the dorsal markings are invariably indistinct.

The examination of twenty-five stomachs indicates that ants form a much larger proportion of the food than in *A. cristatellus*. The contents are classified as follows: Empty, 3; unidentifiable insect remains, 4; ant remains, 12; beetle remains, 5; spiders, 2; cockroach, 1; earwig, 1; flies, 1; lizard skin (doubtless its own), 1.

### **Anolis evermanni** Stejneger

The following localities are represented by thirty-seven specimens in the collection: Adjuntas, Aibonito, Maricao, and El Yunque. This species is confined to Porto Rico and does not appear to be especially related to the green *Anolis* of Hispaniola (*A. chlorocyanus*). It appears to be closely related to *Anolis mayeri* Fowler of the Virgin Islands. In Porto Rico it is most abundant in the coffee belt, but reaches the coastal plain at Rio Piedras and doubtless occasionally elsewhere.

As in *A. stratulus*, the scale between the supraciliaries and the supra-orbital semicircles, anterior to the supraorbital granules, is remarkably constant. It is double on one side in only one specimen out of thirty-one examined. The semicircles may be broadly in contact (3 specimens), narrowly in contact (9), or separated by a single row of scales (19). The scales between the semicircles and the occipital vary from two to four.

*Anolis mayeri* from the Virgin Islands was compared in the original description with *Anolis cuvieri* and *Anolis cristatellus* (Fowler, 1918, Papers Dept. Marine Biol., Carnegie Inst., XII, p. 8, Fig. 4), chiefly because of the presence of small granular scales interspersed between the larger dorsal scales. On examination with sufficient magnification, both *A. cristatellus* and *A. evermanni* prove to exhibit this character. *A. mayeri* is therefore not particularly related to *A. cuvieri* and is in fact intermediate between *A. cristatellus* and *A. evermanni*, having the two scales bordering the supraocular granules anteriorly of *A. cristatellus*, while it is closely allied to *A. evermanni* by its habitus (especially the form of the head and tail), the larger scales, and the uniform (green) coloration. It is remarkable that no other specimens of this species have appeared in the numerous collections from the Virgin Islands.

The results of the examination of the contents of twenty stomachs are as follows: Empty, 3; beetle remains, 11; wasps, 2; ants, 1; caterpillars, 1; spiders, 1; skin of *Anolis* (doubtless its own), 2; juvenile *Anolis evermanni*, 1.

### ***Anolis pulchellus* Duméril and Bibron**

The following localities are represented by eighty-seven specimens in the collection: Aibonito, Cataño, Coamo Springs, Ensenada, Maricao, Mayaguez, San Turce, Culebra and Vieques Islands.

*Anolis pulchellus* is recorded from nearly all of the Virgin Islands, including Anegada and St. Croix. Except for its absence from Mona Island, it has therefore the same distribution as *Anolis cristatellus*.

The number of loreal scales in a vertical row is usually four (five or six in *A. krugi*); in eighty-five specimens, sixty-nine have four loreal rows, fifteen have five, and one has six. The scales separating the occipital from the supraorbital semicircles number one in one specimen, two in twenty-nine specimens, three in fifty-one, and four in four. The semicircles are in contact in seventeen specimens, separated by one scale row in sixty-six, and by two scale rows in two.

Stejneger supposed that *Anolis pulchellus* was confined to the coastal plain area, rarely going above five hundred feet in altitude. In the course

of the present survey it was found to be abundant everywhere, up to an altitude of at least two thousand feet, but strictly confined to open fields.

### **Anolis krugi** Peters

The following localities are represented by sixty-two specimens in the collection: Adjuntas, Aibonito, Coamo Springs, Maricao, and El Yunque. *Anolis krugi* is confined to Porto Rico. In Porto Rico it is confined largely to the coffee belt, extending beyond it only where similar habitat conditions occur. It is directly related to the more widely distributed *Anolis pulchellus* and is probably derived from it. The specimens recorded from Guanica by Fowler (1918, Papers Dept. Marine Biol., Carnegie Inst., XII, p. 11) prove on re-examination to be *A. pulchellus*.

In sixty specimens, the number of loreal scales in a vertical row is four in one specimen, five in thirty-four, six in twenty-three, and seven in two. The number of scales between the occipital and the supraorbital semicircles varies from one to six—one in one specimen, two in eighteen, three in twenty-five, four in thirteen, five in two, and six in one. The supraorbital semicircles are in contact in two specimens, separated by a single scale row in thirty-four, by two scales rows in nineteen, and by three in five. This species is often difficult to distinguish from *A. pulchellus* without direct comparison; the color of the dewlap in life, orange instead of crimson, is distinctive. In alcoholic specimens the narrower band of enlarged dorsal scales is the most satisfactory character for separating the two. Other characters are at best comparative, useful only for a series of specimens.

Stejneger distinguished *Anolis krugi* as characteristic of the intermediate altitudes, from five hundred to fifteen hundred feet. The specimens in the present series from Coamo Springs are from an altitude of less than three hundred feet, while specimens from Aibonito reach an altitude of at least two thousand feet. The specimens from Coamo Springs supply the clue to the determining factor in the distribution of the species, for at that locality it was abundant among the ferns and vines of the moist, dark gorge back of the bath-houses and was found nowhere else. At Aibonito and Maricao, *Anolis pulchellus* was found on the bare hilltops or in open fields, while a few steps within the borders of the coffee plantations only *A. krugi* was to be found. Moisture and shade, therefore, are the habitat requirements of *Anolis krugi*. *Anolis cristatellus* and *Anolis gundlachi* have an exactly parallel distribution.



**Anolis pencensis** Stejneger

Thirty-eight specimens of this species were collected at Coamo Springs and Ensenada. This very distinct species of *Anolis* is confined to Porto Rico, and specifically to the arid southwestern area from Coamo Springs to Ensenada (and probably to Cabo Rojo).

*Anolis pencensis* is a highly unique species, not only in its lepidosis, but in the extremely small size of its throat fan, scarcely one-third as large as that of *A. pulchellus* or *A. krugi* when extended. There is little variation in the present series, which is much the largest hitherto examined. The coloration described by Stejneger is characteristic and constant. The females invariably have a broad mid-dorsal band. The loreal rows in a vertical line are three in eighteen specimens, four in twenty. The scales between the occipital and the supraorbital semicircles are none in two specimens, one in twenty-one, and two in fourteen. The scale rows separating the supraorbital semicircles are none in thirty-two specimens, one in six. This species was found associated with *Anolis cristatellus* and with a rare *A. pulchellus*, at both Coamo Springs and Ensenada. Broadly speaking, it replaces *A. pulchellus* in the southwestern part of the island, inhabiting fences and grazing land much as *A. pulchellus* does in the remaining part of the island. A few specimens were found on the arid cactus-covered hilltops about Ensenada. Near Coamo Springs this species occurred in colonies, sometimes a mile or more apart.

**Cyclura** Harlan**Cyclura stejnegeri** Barbour and Noble

One specimen of this species was collected on Mona Island. This single specimen is a very old male with the irregular development of the large tubercular scales of the head characteristic of old specimens of this group. The nasal is separated from the rostral on one side by a space filled with very small scales; on the other by a large tubercular shield. A third "comb" is plainly distinguishable on the third toe. The scales of the reproduced tip of the tail are not arranged in verticils.

The measurements as as follows:

Total length (tail reproduced).....	910 mm.
Body.....	470 "
Length of head.....	127 "
Breadth of head.....	79 "
Foreleg.....	173 "
Hind leg.....	260 "

In spite of the separation of the nasal shield from the rostral, I have retained the name *stejnegeri*, as it may well be the case that the young of the three related species, *cornuta*, *nigerrima*, and *stejnegeri*, are well distinguishable, while in the adults the characters are obscured. In other respects it accords well with the previously described specimens from Mona. Additional material of *cornuta*, however, is required to establish satisfactorily the status of the forms on Mona and Navassa.

### **Celestus Gray**

#### **Celestus pleii (Duméril and Bibron)**

Seven specimens were collected at Aibonito. This species is confined to Porto Rico, where it is apparently rare and of local distribution.

The present series is so uniform in scale characters as to suggest that they are directly related. The proportion of the length of the forelimb to that of the body varies between 12:100 and 15:100. The scales about the body are 34 in one, 35 in one, 36 in four, and 38 in one.

The two female specimens contain respectively one and three well advanced embryos. The egg measures 18 x 11 mm. The completely formed embryo rests on a very large yolk mass. The head and legs of the embryo are proportionately larger than in the adult, while the tail is shorter.

### **Ameiva Meyer**

#### **Ameiva exsul Cope**

The following localities are represented by fifty-two specimens in the collection: Coamo Springs, Ensenada, Palo, Seco Point, San Truce, and Culebra Island. This species reaches a large size, apparently much exceeding half a meter, but the larger specimens are exceptionally wary and I was unable to secure them. The largest seen was on Culebra Island. In nearly all the specimens examined an additional row of ventral plates on each side is enlarged to a varying degree, in some cases to such an extent that there are distinctly twelve longitudinal rows of ventrals.

The common report in Porto Rico that the "iguana" eats the shoots of young corn appears to be supported to a degree by an examination of stomach contents. Of twenty stomachs examined, one was empty; eleven contained vegetable matter, chiefly large numbers of red-coated seeds; five, unidentifiable insect remains; two, crickets; three, small crabs; three, eggs of a lizard; one, tail of a large *Anolis cristatellus*; and six, parasitic worms.

***Ameiva alboguttata* Boulenger**

Forty-two specimens were collected on Mona Island. This species is confined to Mona Island, where it is abundant on the low terrace to the west and south.

*Ameiva alboguttata* is extremely close to *Ameiva exsul*, but may be distinguished by the more spotted dorsum. The Mona Island form does not exhibit the tendency to enlargement of an additional row of ventral plates, one specimen having only eight longitudinal rows of ventrals (No. 13739).

The results of the examination of twenty stomachs are as follows: Empty, 4; vegetable matter (chiefly red-coated seeds), 8; unidentifiable insect remains, 3; beetles, 3; crickets, 2; land snails, 2; *Anolis cristatellus* (juv.), 1.

***Ameiva wetmorei* Stejneger**

Twenty-seven specimens were collected from Ensenada. This species, hitherto known only from two specimens, appears to be confined to the region near Ensenada. It probably ranges westward toward Cabo Rojo and eastward toward Ponce, on the limestone hills. *Ameiva lineolata*, its relative in Hispaniola, appears to be similarly confined to the more arid parts of that island, and arid or semiarid conditions prevail also on Great Inagua and St. Croix, each of which is inhabited by a related species. These four species form a highly interesting group of Ameivas, characterized by the oblique scales of the tail, a distinctive habitus, and a lineolate type of coloration.

In the present series the prefrontals are broadly in contact in twenty-one specimens, meet at a point in one, and are separated by a suture between the frontal and frontonasal in three. The number of supraciliaries varies from five to seven; normally six. The interparietal is horizontally divided in one specimen. There are usually two or three transversely enlarged postoccipitals. On the whole, there is a remarkably small degree of variation.

The measurements of a male and female specimen are:

	A. M. N. II.	
	No. 13821 ♂	No. 13828 ♀
Total length (tail reproduced at tip).....	169 mm.	147 mm.
Body.....	52 "	45 "
Length of head.....	12.5 "	11 "
Breadth of head.....	8.5 "	6.5 "
Foreleg.....	16 "	14 "
Hind leg.....	30 "	26 "

This species was found only on or near the tops of the limestone hills back of Ensenada, associated with a few *Ameiva exsul*.

### **Amphisbæna Linné**

#### **Amphisbæna cæca Cuvier**

Eighteen specimens of this species were collected at Aibonito, Bayamon, and Rio Piedras. This species is confined to Porto Rico, with a related species in the Virgin Islands (*A. fenestrata*) and another in Hispaniola (*A. manni*).

The variation in the present series falls well within the limits established by Stejneger. One specimen has a small supraocular plate on each side. When killed in formalin, the head is bent abruptly to one side, indicating apparently a special development of the muscles of the neck, which doubtless is of advantage to the animal in burrowing. The largest specimen measures 233 mm.; tail, 18 mm.

All of the specimens were found burrowing in the ground, most of them uncovered by cultivation. One was found about three inches beneath an ant's nest, under a log, while digging up the eggs of *Leimadophis*. Three eggs were found—one beneath a termite nest, the other two under the log where the above-mentioned adult was dug up. The largest egg measured 42 x 11 mm.

### **Mabuya Fitzinger**

#### **Mabuya sloanii (Daudin)**

The following localities are represented by seven specimens in the collection: Bayamon, Ensenada, and Mona and Culebra Islands. This species ranges from Mona Island through Porto Rico and the Virgin Islands. Barbour (1916, p. 219) refers two specimens from Turk's Island, in the southern Bahamas, to this species, and it seems probable that the *Mabuya* of Hispaniola is also referable to the same species.

With seven specimens before me—three from Culebra, three from Porto Rico, and one from Mona—I am unable to find differences corresponding to the separate localities, other than the difference in color described below. In all specimens there are two pairs of chin shields in contact behind the unpaired postmental. The prefrontals are narrowly or widely separated by a suture between the frontal and the frontonasal. The supraoculars are three on one side in one specimen. One specimen has three large occipitals on one side. The scales about the body are thirty-two in the specimens from Culebra and Mona and in one from Porto Rico, thirty in the remaining two.



The coloration is highly interesting. The three specimens from Porto Rico agree with the description of Stejneger (1904, p. 611) in the presence of a narrow black border above the dorsolateral light line. In the specimens from Culebra this is increased anteriorly to include the whole of the head, neck, and shoulders, leaving, however, a sharply defined median light line from the frontal to the shoulders, where it merges into the dorsal color. This pattern is approximated also in the specimen from Mona Island. It is evident that the type of *Euprepes semitaniatus* Wiegmann described by Stejneger (1904, p. 610) corresponds accurately with the Culebra specimens. It is therefore possible that the Porto Rican form may be sufficiently distinguishable to merit specific or subspecific designation, in which case *sloanii* would be restricted to the form in the Virgin Islands (including Vieques and Culebra) and *M. nitida* Garman would be applicable to the Porto Rican and Santo Domingan form. In view of the close approach of the Mona specimen to those from Culebra, I prefer to retain, for the present, the use of *sloanii* for the entire series.

The measurements of the only specimen with a complete tail are as follows:

	A. M. N. H. No. 14007
Length.....	180 mm.
Body.....	67 "
Length of head.....	15 "
Breadth of head.....	10 "
Foreleg.....	17 "
Hind leg.....	25 "

The largest specimen (from Culebra) measures 90 mm. from snout to vent.

### **Typhlops** Oppel

#### **Typhlops richardii** Duméril and Bibron

*Typhlops richardii* Duméril and Bibron, 1844, Erpetol. Gen., VI, p. 290.

*Typhlops lumbricalis* Stejneger, 1904, Rept. U. S. Nat. Mus., 1902, p. 684, figs. 141-144.

*Typhlops lumbricalis* (part) Barbour, 1914, Mem. Mus. Comp. Zool., XLIV, p. 322.

Nineteen specimens of this species were collected at Bayamon.

The common species of *Typhlops* in Porto Rico has been referred to *T. lumbricalis* by all authors since the publication of Boulenger's "Catalogue of Snakes" (1893). The large series now before me appear to warrant a distinction of the Porto Rican form, for which I have used the

name applied by Duméril and Bibron to the *Typhlops* from St. Thomas, on the ground that it is logically likely to be conspecific with the Porto Rican form. In its more elongate form and greater number of scales from snout to vent, the description of *T. richardii* applies fairly well to the series from Porto Rico. *Typhlops lumbricalis* is reported from all of the Greater Antilles and from a large number of the Lesser Antilles. Being unable to examine specimens from the Lesser Antilles, I am unable to form an opinion as to the status of the form found there. The Linnean description of *T. lumbricalis* is said by Duméril and Bibron to be taken from the Jamaican *Amphisbæna argenta* of Browne. Not having Jamaican specimens for comparison, I have compared the Porto Rican series with the specimens from Cuba in The American Museum of Natural History.

In fourteen specimens examined in detail, the total length varies from 216 to 310 mm.; average, 266 mm. The largest specimen available from Cuba measures 244 mm., the average length of nine specimens is 203 mm., and the specimen selected by Barbour for description in the "Herpetology of Cuba" (Barbour and Ramsden, 1919, Mem. Mus. Comp. Zoöl., Cambridge, XLVII, p. 185) measures only 182 mm. It appears, therefore, that the Porto Rican and Cuban *Typhlops* are distinctly different in adult size. The ratio of the body diameter to total length is only slightly different in the two series, 34 to 44 in the Porto Rican, 27 to 38 in Cuban. The number of scales about the body is 22-20-20 in seven specimens, 22-20-18 in seven, in the Porto Rican series; the reduction to 20 scale rows occurring only a little anterior to the middle of the body. In the Cuban series the scale formula is 20-20-18 in six, 20-18-18 in three specimens. The number of scales counted on the mid-dorsal line from snout to tail spine ranges from 365 to 415 in the Porto Rican specimens and from 270 to 325 in the Cuban. (The Cuban specimen described by Barbour has been reexamined at my request by Mr. Emmett R. Dunn and is found to have between 320 and 325 scales on the mid-dorsal line.) In spite of the relatively small series of Cuban specimens at my disposal, it seems unlikely that the range of variation of a larger number would be greatly different.

The Porto Rican specimens are darker in color, and, with a single exception, the tail is marked with a white ring. In the specimen described by Stejneger (1904, p. 685), as well as in the exception here noted, the white ventral color forms a prominent notch on the side of the tail, indicating the existence of the tendency to form a ring. No such notch or ring is found in Santo Domingan or Cuban specimens.

The differences, then, between the Porto Rican and the Cuban *Typhlops* may be summarized as follows:

	Porto Rican	Cuban
Average length of adult.....	Greater than 250 mm.	Less than 250 mm.
Scales about the body.....	22-20-20 or 22-20-18	20-20-18 or 20-18-18
Scales from snout to tail spine.	365-415	270-325
Tail.....	With white ring or notch	Without white ring or notch

The specimens of the present series were found during cultivation on the farm of Mr. B. A. Wall. The single specimen secured by me personally was burrowing in the loose earth around an old stump, in which both *Typhlops* and *Leimadophis* eggs were found.

Three eggs of this species were found in the soil about the same stump, containing well-developed embryos. The egg is elongated, like a slightly bent cylinder with rounded ends, with a perfectly smooth, white surface. The embryo measures 98 mm. in length and 3 mm. in diameter. The smallest hatched specimens found measure 114 mm.

Three of the smallest specimens in the collection are in every way like the adults, except that they are pale grayish white. This appears on examination to be caused by the opacity of the skin, which is nearly ready to be shed, probably for the first time. An adult Cuban specimen in the collection has the same appearance, and the underlying skin proves to be normally colored. Some of the cases of supposed albinism in *T. lumbricalis* may be due to this appearance.

### ***Typhlops rostellatus* Stejneger**

Eleven specimens of this species were collected at Aibonito and Bayamon. This species is confined to Porto Rico, where it proves to be widely distributed.

It is readily distinguished from *T. lumbricalis* by its nearly uniform coloration above and below and the sharply defined white subcaudal spot. There is little variation in the present series. The scales about the body number twenty in ten specimens, eighteen in one.

The measurements of the largest specimen are as follows:

	A. M. N. H. No. 13345
Total length.....	205 mm.
Tail.....	5 "
Greatest diameter.....	4.5 "

**Leimadophis Fitzinger****Leimadophis stahli Stejneger**

Twenty-four specimens of this species were collected at Aibonito, Bayamon, and Ensenada. *Leimadophis stahli* is confined to Porto Rico, replaced by a vicarious form, *L. exiguus*, in the Virgin Islands, and closely related to the Hispaniolan *L. parvifrons*.

The range in number of ventral plates is slightly greater in this series than in Stejneger's—146-166 in twenty-three specimens. The subcaudals range from 83-94. The sexes are scarcely distinguishable by these characters. The tail length varies from .29 to .34 of the total length (.29-.31 in ♀, .32-.34 in ♂ specimens). The scales about the body are uniformly 19-19-17. The lower labials are nine (eight in the original description). Freshly hatched specimens show the color pattern most distinctly, especially the median black marking on the head. The largest specimen, a female, measures 580 mm.; tail, 178 mm.

Eggs of this species were found in three places: under a log in a pasture and under an old termite nest in a coffee plantation at Aibonito and in the loose soil under a stump at Bayamon. One lot contained seven eggs, one thirteen, and one forty. Six well-developed eggs were found in the adult female staying with the largest number. The eggs in this place were in three lots: eighteen old and discolored, in two clusters; six loose, somewhat different in appearance; and two clusters of six and ten eggs very fresh and white. Examination of the eggs showed that they contained embryos at at least three stages, the fresher eggs having scarcely begun development, the oldest containing embryos nearly ready to hatch. The eggs found under the termite nest were also in two clusters—one of seven eggs, with advanced embryos, the other of six, with no apparent development. The older eggs are slightly larger, ranging from 21 to 25 mm. in length and from 12 to 15 mm. in diameter. The surface is finely striate, very white in the fresher specimens. It appears that the adult females of this species take up a location from which they do not wander far, and in which they lay successive batches of eggs, from six to eighteen (?) in number. The largest "nest" contained the remains of still older eggs, which were either infertile or from which the young had hatched. The eggs are laid in clusters of six to ten, the individual eggs adhering firmly to the mass. The rate of reproduction is evidently fairly rapid.



**Alsophis Fitzinger****Alsophis antillensis (Schlegel)**

*Alsophis anegadae* Barbour, 1917, Proc. Biol. Soc. Wash., XXX, p. 102.

Two specimens were collected at Coamo Springs. This species has not hitherto been recorded from Porto Rico, although there is an older, questionable record from Haiti. Its presence in Porto Rico, together with that of *Eleutherodactylus antillensis*, diminishes the difference between the Porto Rican fauna and that of the Virgin Islands.

The identification of these two specimens with this species removes the element of geographical distinctness from the allied *A. portoricensis*. The male specimen has only seventeen scale rows, and so might be identified with *A. portoricensis*, were it not that the coloration of both is nearly typical of *A. antillensis*, while the female has nineteen scale rows at mid-body. In view of the higher number of ventral plates and the distinct coloration, I prefer to retain *portoricensis* and *antillensis* as distinct species.

These specimens agree closely in coloration with the color variety described by Barbour from Anegada, and as I do not wish to admit of a discontinuous distribution of *A. anegadae*, it seems best to include both Porto Rican and Anegadan specimens with *A. antillensis*.

The measurements and scale characters are as follows:

	A. M. N. H.	
	No. 13305 ♂	No. 13306 ♀
Length.....	707 mm.	820 mm.
Tail.....	245 "	270 "
Tail length.....	.35 "	.33 "
Ventral plates.....	184 "	185 "
Subcaudals.....	134 "	132 "
Dorsal scales.....	17-17-15 "	17-19-15 "

**Alsophis portoricensis Reinhardt and Luetken**

Four specimens of this species were collected, at Adjuntas and on Mona Island. This species is confined to Porto Rico and Mona Island, its nearest relatives being *A. melanichnus* in Hispaniola and *A. antillensis* in Porto Rico and the Virgin Islands.

The two specimens from Adjuntas are perfectly typical in coloration, the dorsal scales and ventral plates being heavily bordered with black. In the two Mona Island specimens the black is arranged as irregular transverse markings, not confined to the borders of the scales. There does not seem to be any scale character distinguishing them from typical

*portoricensis*. The four specimens fall within the limits of variation established by Stejneger in every respect. The two from Adjuntas have the dorsal scale formula of 17-17-14 instead of 17-17-15, as in the Mona Island specimens.

The stomach of one of the specimens from Mona contained the remains of two *Ameiva alboguttata*, and that of the other contained a tail of the same species.

#### LITERATURE

##### BARBOUR, THOMAS

1914. A contribution to the zoögeography of the West Indies, with especial reference to amphibians and reptiles. Mem. Mus. Comp. Zoöl., XLIV, pp. 209-359, Pl. I, text-fig. 1.
1915. Recent notes regarding West Indian reptiles and amphibians. Proc. Biol. Soc. Wash., XXVIII, pp. 71-78.
1916. Additional notes on West Indian reptiles and amphibians. Proc. Biol. Soc. Wash., XXIX, pp. 215-220.
1917. Notes on the herpetology of the Virgin Islands. Proc. Biol. Soc. Wash., XXX, pp. 97-104.
1919. Herpetological notes. Notes on *Celestus*. Proc. New England Zoöl. Club, VII, pp. 11-13.
- 1919a. A new rock iguana from Porto Rico. Proc. Biol. Soc. Wash., XXXII, pp. 145-148, Pl. I.

##### BARBOUR, THOMAS, and NOBLE, G. KINGSLEY

1915. A revision of the lizards of the genus *Ameiva*. Bull. Mus. Comp. Zoöl., LX, pp. 139-164, Pls. I-XV.

##### FOWLER, HENRY W.

1918. Some amphibians and reptiles from Porto Rico and the Virgin Islands. Papers Dept. Marine Biol., Carnegie Inst., XII, pp. 1-15, Pl. I, text-figs. 1-6.

##### STEJNEGER, LEONHARD

1904. The herpetology of Porto Rico. Rept. U. S. Nat. Mus., 1902, pp. 549-724, Pl. I, text-figs. 1-197.
1913. A new lizard from Porto Rico. Proc. Biol. Soc. Wash., XXVI, pp. 69-72.